

## **16th ICCRTS**

### **“Collective C2 in Multinational Civil-Military Operations”**

#### **Title of Paper**

Command and Control Analysis of the South West Provincial Regional Emergency Operations Centre during Vancouver 2010

#### **Topic(s)**

C2, Management, and Governance in Civil-Military Operations

#### **Name of Author(s)**

Lynne Genik

Defence Research and Development Canada - Centre for Security Science  
222 Nepean St, 11th Floor  
Ottawa, ON K1A 0K2

David G. Smith

Defence Research and Development Canada - Toronto  
1133 Sheppard Avenue West, P.O. Box 2000  
Toronto, ON M3M 2B9

#### **Point of Contact**

Lynne Genik

Defence Research and Development Canada - Centre for Security Science  
222 Nepean St, 11th Floor  
Ottawa, ON K1A 0K2  
[Lynne.genik@drdc-rddc.gc.ca](mailto:Lynne.genik@drdc-rddc.gc.ca)  
[Lynne.genik@forces.gc.ca](mailto:Lynne.genik@forces.gc.ca)  
613-943-2499

Report Documentation Page			Form Approved OMB No. 0704-0188	
<p>Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p>				
1. REPORT DATE <b>JUN 2011</b>	2. REPORT TYPE	3. DATES COVERED <b>00-00-2011 to 00-00-2011</b>		
<b>4. TITLE AND SUBTITLE</b> <b>Command and Control Analysis of the South West Provincial Regional Emergency Operations Centre during Vancouver 2010</b>			5a. CONTRACT NUMBER	
			5b. GRANT NUMBER	
			5c. PROGRAM ELEMENT NUMBER	
<b>6. AUTHOR(S)</b>			5d. PROJECT NUMBER	
			5e. TASK NUMBER	
			5f. WORK UNIT NUMBER	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> <b>Defence Research and Development Canada - Centre for Security Science, 222 Nepean St, 11th Floor, Ottawa, ON K1A 0K2,</b>			8. PERFORMING ORGANIZATION REPORT NUMBER	
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>			10. SPONSOR/MONITOR'S ACRONYM(S)	
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
<b>12. DISTRIBUTION/AVAILABILITY STATEMENT</b> <b>Approved for public release; distribution unlimited</b>				
<b>13. SUPPLEMENTARY NOTES</b> <b>Presented at the 16th International Command and Control Research and Technology Symposium (ICCRTS 2011), Qu?c City, Qu?c, Canada, June 21-23, 2011. U.S. Government or Federal Rights License.</b>				
<b>14. ABSTRACT</b> <p>British Columbia hosted the Vancouver 2010 Olympic Winter Games (V2010) between February 12 and 28, 2010. During this time, the Emergency Management British Columbia (EMBC) South West Provincial Regional Emergency Operations Centre (SWE PREOC) was activated in order to monitor and respond to incidents. Defence Research and Development Canada (DRDC) scientists observed SWE PREOC operations from a command and control (C2) perspective during the Games in order to provide feedback for improved operations. This paper describes the SWE PREOC's role for V2010, the context for ?normal? operations and the operating environment for the Olympics activation, and the methodology for C2 analysis. Two aspects of the activation made it unique: (1) the SWE PREOC activated for a planned event versus in response to emergency incidents, and (2) the SWE PREOC had to work with new and significant organizations for the Games, such as the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC) and the Integrated Security Unit (ISU). The issues observed during operations and suggested recommendations for operations that may encounter similar types of issues are discussed, along with the impact of the deviations from normal SWE PREOC operations.</p>				
<b>15. SUBJECT TERMS</b>				
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b> <b>Same as Report (SAR)</b>	
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>	18. NUMBER OF PAGES <b>44</b>	19a. NAME OF RESPONSIBLE PERSON



# **Command and Control Analysis of the South West Provincial Regional Emergency Operations Centre during Vancouver 2010**

Lynne Genik, MSc  
DRDC Centre for Security Science  
222 Nepean St, 11<sup>th</sup> Floor  
Ottawa, ON K1A 0K2  
[lynne.genik@drdc-rddc.gc.ca](mailto:lynne.genik@drdc-rddc.gc.ca)

David Smith, PhD  
DRDC Toronto  
1133 Sheppard Ave W  
P.O. Box 2000  
Toronto, Ontario, M3M 2B9  
[David.smith@drdc-rddc.gc.ca](mailto:David.smith@drdc-rddc.gc.ca)

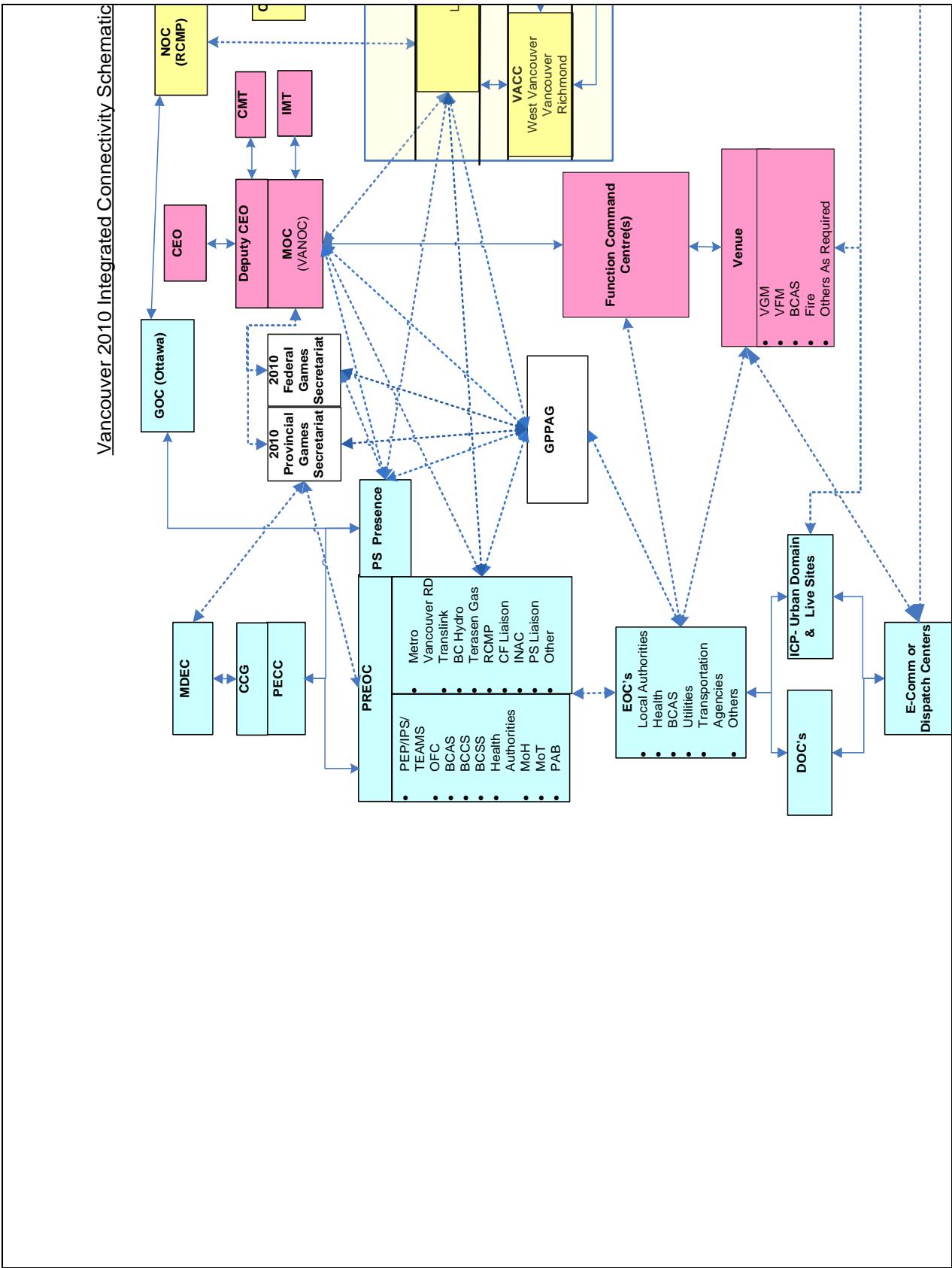
## **Abstract**

British Columbia hosted the Vancouver 2010 Olympic Winter Games (V2010) between February 12 and 28, 2010. During this time, the Emergency Management British Columbia (EMBC) South West Provincial Regional Emergency Operations Centre (SWE PREOC) was activated in order to monitor and respond to incidents. Defence Research and Development Canada (DRDC) scientists observed SWE PREOC operations from a command and control (C2) perspective during the Games in order to provide feedback for improved operations. This paper describes the SWE PREOC's role for V2010, the context for "normal" operations and the operating environment for the Olympics activation, and the methodology for C2 analysis. Two aspects of the activation made it unique: (1) the SWE PREOC activated for a planned event versus in response to emergency incidents, and (2) the SWE PREOC had to work with new and significant organizations for the Games, such as the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC) and the Integrated Security Unit (ISU). The issues observed during operations and suggested recommendations for operations that may encounter similar types of issues are discussed, along with the impact of the deviations from normal SWE PREOC operations.

## **1.0 INTRODUCTION**

The Vancouver 2010 Olympic and Paralympic Winter Games (V2010) were hosted in British Columbia in February and March 2010. Figure 1 shows the Vancouver 2010 Integrated Connectivity Schematic, illustrating the information sharing and decision authority links between many of the key organizations involved in the safe and secure delivery of the Games (a list of acronyms is contained in Annex A). These organizations were aligned along three "pillars": Public Safety (blue), Games (pink), and Security (yellow). Emergency Management British Columbia was the lead organization for public safety, the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC) led games operations, and the Integrated Security Unit (ISU) was the lead for security. It is important to note that the "Games" and "Security" structures, as denoted in the figure, were created explicitly for V2010, and the "Public Safety" (blue) structure was the only pre-existing structure. The South West Provincial Emergency Operations Centre, the focus of this paper, is denoted in the figure as the "PREOC", the largest box in the Public Safety (blue) column.

Two new organizations were created for V2010 that held significant authority:



**Figure 1.**Vancouver 2010 Integrated Connectivity Schematic (acronyms in Annex A)

1. The Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC), responsible for games operations and depicted in the figure in pink;
2. The Integrated Security Unit (ISU), led by the Royal Canadian Mounted Police (RCMP) and including the Canadian Forces and a number of police departments, responsible for games security. The ISU was comprised of a number of groups and commands centres as shown in yellow the figure. The National Operations Centre (NOC) and RCMP Pacific Region Deputy Commissioner were not part of the ISU itself but oversaw the ISU in the security reporting structure.

VANOC and ISU responsibilities rested heavily at the venues, with a VANOC General Manager and an ISU Bronze Commander at each of the primary venues, while the authority and responsibility of EMBC (and the PREOC) generally rested in the area outside the venues, in what was referred to as the “urban domain”. Prior to the Games, the PREOC had established and exercised information sharing links with these new organizations.

Three large scale exercises, Bronze (November 2008), Silver (February 2009) and Gold (November 2009), comprising the V2010 Integrated Exercise Series, were conducted to exercise and confirm the readiness of games partners. Exercise Bronze was a “table top” exercise, with games-time scenarios discussed in multi-disciplinary groups. Exercises Silver and Gold were large-scale “command post” exercises with events that were simulated to occur during the Olympics (for example, Exercise Gold included more than 140 agencies, 45 coordination centres, and 2000 participants<sup>1</sup>). The PREOC was activated for Exercises Silver and Gold.

## **1.1 The South West Provincial Regional Emergency Operations Centre**

Emergency Management British Columbia (EMBC) divides the province of British Columbia (BC) into regions, each overseen by a Provincial Regional Emergency Operations Centre (PREOC), to coordinate the provincial response to emergencies and disasters. The South West PREOC’s normal region of responsibility encompassed the V2010 venues in Greater Vancouver and Whistler and was slightly expanded for V2010 to incorporate alternate transportation corridors to Whistler and to correspond to the geographic boundaries chosen by the ISU and Canadian Forces.

The role of the South West Provincial Regional Emergency Operations Centre (hereafter referred to as “the PREOC”) during V2010 was to:

- Coordinate the province’s response to emergencies and disasters within a designated region;
- Coordinate regional provincial and agency support for a local authority, First Nations or other provincial ministry or agency;

---

<sup>1</sup> Numbers from the Directorate of Land Synthetic Environments (DLSE), exercise coordinators

- Prioritize the deployment of provincial and/or critical resources on a regional basis;
- Report directly to and take policy direction from the Provincial Emergency Coordination Centre (PECC);
- Provide the PECC with situational information on events within the region including PREOC activities in support of local authorities;
- Request resources from the PECC whenever appropriate and/or sufficient resources are not available within the region. Additional resources may include, but are not limited to, those provided by provincial, federal or international agencies as well as the private sector;
- Coordinate information sharing with games and security pillars [1].

The last task was new for V2010 while the others also apply to normal PREOC activations.

The PREOC follows an Incident Command System in their organizational structure in accordance with the British Columbia Emergency Response Management System (BCERMS) [2], typically activating and scaling in response to emergency events in the southwest region of BC. The PREOC was accustomed to activations in response to natural hazard and accidental events such as wild fires, floods, landslides, lodging fires, power outages, etc. and dealt with supporting organizations accordingly. However, the Olympics were unique as a major event requiring the support of public safety and security organizations. For V2010, management, operations, planning, and logistics teams were established within the PREOC in accordance with the normal BCERMS structure and hosted in the PREOC's command room. A number of critical infrastructure, provincial ministry, and federal agency representatives, as listed under the PREOC in Figure 1, were hosted in the PREOC's agency room during the Olympics. There was also an increased federal presence with Public Safety Canada (denoted in Figure 1 as the "PS Presence"), located in temporary trailers on site. Given the number of organizations hosted at the PREOC along with its role for V2010, the PREOC was a key hub for information sharing and situational awareness during the Games.

## **2.0 COMMAND AND CONTROL (C2) ANALYSIS METHODOLOGY**

In 2008, the first author was seconded to Integrated Public Safety (IPS), a unit established within EMBC to focus on games public safety planning, as scientific advisor from Defence Research and Development Canada (DRDC). In this role she became a member of the exercise evaluation team during Exercise Bronze and led DRDC teams for C2 analysis at the PREOC for Exercise Silver and Gold. Based on the observations during the exercises and the recommendations provided [3, 4], the PREOC made a number of revisions to plans in order to improve operations. Following Exercise Silver, DRDC scientific advisors worked with PREOC and IPS experts to apply architecture frameworks to PREOC V2010 operations [5] in order to help the PREOC articulate requirements, define processes, understand interactions with other organizations and manage planning for Olympic operations. This helped to focus the C2 analysis performed by DRDC for Exercise Gold and the Games. Having a scientific advisor embedded with IPS was invaluable for establishing a trust relationship between EMBC (the PREOC and

IPS) and DRDC and demonstrating the value of DRDC contributions during planning activities and exercises. Buy-in and trust is essential to successful operational analysis, as discussed by Smith and Macea [6].

## 2.1 DRDC Resources

The first author was deployed to the PREOC as scientific advisor during the Olympics. She led the C2 planning for the PREOC and contributed to the C2 analysis.

The second author participated in the development of the C2 plan and was deployed to the PREOC to perform C2 analysis for the PREOC's activation during the Olympics. He had extensive C2 analysis experience during the V2010 Integrated Exercise Series as a lead C2 analyst at the ISU for Exercises Silver and Gold.

An additional scientist was deployed to the PREOC for coverage in the scientific advisor position during the Olympics, and contributed to the C2 analysis. He was a member of DRDC's C2 analysis team at the ISU during the V2010 Integrated Exercise Series and worked as a scientific advisor at RCMP Headquarters.

## 2.2 Preparatory Research and Experience

The scientists involved in the V2010 C2 analysis at the PREOC had previous experience in collecting data and performing command and control analysis for various operations centres participating in the V2010 Integrated Exercise Series. While the first author had been working with EMBC for a significant amount of time and had detailed knowledge of the PREOC operations and plans, the two scientists new to the PREOC had to gain a sufficient understanding of operations, procedures, and the roles of the various staff involved. This was achieved through reviewing relevant documents, advance discussions with EMBC, and information sharing between the IPS scientific advisor and other members of the DRDC team.

Examples of documents reviewed in preparation for the C2 analysis included:

- Concept of operations documents, such as the PREOC Operational Guidelines in Support of the 2010 Olympic and Paralympic Games [7];
- DRDC letter reports on the analysis of PREOC operations during Exercises Silver and Gold [3, 4];
- Standard Operation Procedures (SOPs), such as rules for logging events, shift handover procedures, etc., some of which were documented while others were communicated orally;
- V2010 Integrated Connectivity Schematic (Figure 1);
- PREOC Management Manual [8];
- British Columbia Emergency Response Management System Overview [2];
- PREOC 2010 Master Staffing Chart;
- Related web sites (for example, the Provincial Emergency Program, VANOC and the ISU) and newspaper articles;

- Government mandates and policy regarding the operation and the roles of organizations.

Developing an understanding of the operation was critical because it provided the operational context and allowed analysts to understand policies, plans, roles and actions of the various operators. In the authors' experience, if operators believe that an analyst understands the operation they are more likely to discuss issues and share information.

### **2.3 Focus of C2 Analysis**

Given the limited DRDC resources available for C2 analysis and the large staff (management, operations, planning, and logistics teams) at the PREOC, the authors met with and held conference calls with PREOC and IPS management in advance of the Games to discuss the objectives for the games-time analysis, particular areas of focus, and for feedback in the creation of participant survey. As previously mentioned, much of the C2 and architecture framework work done in advance of the Games helped to focus the analysis. The survey questions in Annex C indicate focus areas such as training, roles and responsibilities, the use of tools, situational awareness, information sharing, coordination/decision-making, and general feedback on what worked and what didn't work.

### **2.4 Direct Observation**

Direct observation was performed by the C2 analyst and, as time permitted, by the scientific advisors during their shifts. They observed activity in the command room, attended staff meetings and conference calls, discussed events with staff, and monitored some electronic information as events unfolded. The analysts had access to an electronic information sharing tool called ETeam, where operational information was posted, and received some information (such as Situation Reports) electronically. The C2 analyst had a workspace located next to the Director and Operations Chief and analysts were free to roam to observe activities and talk to staff as required.

### **2.5 Semi-Structured Interviews**

Thirty-three operators were interviewed by the authors between February 11th and 28th. Interviews were semi-structured following the questions presented in Annex B, but allowing the interviewee to discuss other topics that they thought were worth pursuing. The discussions were generally focussed on how the operation was being run, how the operators accomplished their tasks, and what improvements could be made from their perspectives.

### **2.6 Surveys**

A survey (presented in Annex C) was given to all PREOC staff. Fifty-eight operators completed the survey near or after the completion of their final work shift of the operation. The results were analysed and provided in a report to PREOC management

[9]. Although survey results are not discussed in this paper, they provided valuable information on the participants' views of the activation, including what worked well and recommendations for improvement.

## 2.7 Limitations

The PREOC was operational 24/7 during the Olympics but scientists were not present for observation 24/7 due to limited resources. There was only one scientist dedicated to C2 analysis, while the others who contributed also had other duties to fulfill as scientific advisors. Observations were largely restricted by the location/availability of the analyst since he was not always present in the command room (for example, while conducting staff interviews). This was somewhat mitigated by the additional support from the scientific advisors. However, some events were missed completely. In addition, the C2 analysis team was not privy to all electronic communications, such as email sent and received by staff, and therefore were not able to include such information in the analysis.

## 3.0 MAJOR OBSERVATIONS

For V2010, the PREOC had to operate with new organizations that had authority over the Games and security operations. The main groups that the PREOC had to accommodate were VANOC, who planned and managed the Games, the ISU, responsible for games security, and an increased federal presence, in particular with Public Safety Canada. Activating as a pre-planned operations centre was beneficial since it allowed the PREOC to exercise and develop procedures for working with the additional organizations. Through exercises a number of issues had been identified and resolved prior to the Games. However, despite significant preparation, there were some issues identified during the Olympics, which are discussed in the following sections.

There were no major emergency management incidents that occurred during the Olympics. Consequently, the PREOC's role was often limited to situational awareness and information sharing with other organizations.

### 3.1 Sensitive Information Handling

The PREOC experienced challenges with "sensitive"<sup>2</sup> information handling, which included information from security-related sources and critical infrastructure owners (the authors were not aware of classified information exchanges during the Olympics). This was a challenge faced during the exercises as well and likely the most significant challenge for the PREOC during the Games. It was not surprising or unexpected that difficulties were encountered for the following reasons:

---

<sup>2</sup> "Sensitive" information refers to information that some organizations provide in confidence and wish to be careful about sharing (for example, business information that could lead to embarrassment or competitive impacts if divulged), but that has not been officially classified. Protected or classified information generally refers to information that has been categorized in one of several Canadian federal classified categories. Once information is classified then according to Canadian law it can be shared only with appropriately cleared people, using specified communications and storage procedures and equipment.

1. The PREOC did not have a comprehensive policy for the identification and handling of sensitive information and staff were not trained in this area;
2. As a result of (1), sensitive information handling was ultimately at the discretion of the director. Those who held this role had varying views, experience, and comfort levels with the information they had to deal with.

The authors observed that PREOC staff often erred on the over-cautious side, unnecessarily limiting information sharing. This was exacerbated by a fear of potentially reduced information sharing by the ISU as a consequence of inappropriate distribution. The public safety community in BC generally operated in a “need to share” culture, while the security forces generally operated from a “need to know” perspective. The PREOC had invested significant effort in gaining the trust of the ISU and did not want to lose that hard-earned trust. In light of this, combined with a lack of policy, security-related information was typically shared between the director and executive director and those with a perceived “need to know” (such as security agency representatives) during the Olympics.

The lack of a comprehensive policy led to confusion over identifying sensitive information and the rules for sharing. In one example, information provided by a critical infrastructure asset owner was shared outside of the PREOC, to the dismay of the asset owner. In several instances, staff were unsure of who among their colleagues they could share sensitive information with when they became aware of it, which provided challenges in information sharing and discussion of issues. On the other hand, the open working environment meant that conversations between staff or phone calls could often be easily overheard. In one instance it was reported that sensitive information was leaked from the agency room; however, since the information was not clearly identified as sensitive, the person responsible was likely unaware that it was not to be shared.

A further complication in sensitive information handling for the PREOC was a lack of access to appropriate electronic networks for the transmittal of designated (Protected B/C) or classified information. This was not unique to the PREOC – many government (and other) organizations face this issue today. However, the implication was that federal security-related documents deemed to be designated or classified could not be shared electronically with the province. To address this gap, the PREOC relied on agreements with Public Safety Canada and the Department of National Defence, who had installed protected and classified networks in the federal trailers on site.

#### *Recommendations:*

To address sensitive information handling issues during V2010 operations, the authors recommended that sensitive information be clearly identified as such, shared with all PREOC staff, and only shared beyond the PREOC with the explicit consent of the director. This new policy reduced uncertainty and inefficiency in dealing with the information by clearly identifying sensitive information and sharing expectations, and by eliminating unnecessary secrecy and confusion. To address these issues for the longer term, the authors recommended that a comprehensive policy be developed, that critical

infrastructure asset owners be consulted in the development of policy related to the sharing of sensitive asset owner information beyond the PREOC, and that all staff and agency representatives be educated on the policy.

Many operations during an event like V2010 involve the dissemination and processing of sensitive/classified information. Withholding information from those who require it (such as emergency managers) results in the potential for serious operational problems and severe consequences, such as the loss of life. However, if information is inappropriately disseminated there may be negative security and legal repercussions. Hence, a comprehensive policy regarding sensitive information, including definitions and general procedures and responsibilities regarding the documenting, distribution, physical and electronic transmittal, storage, and destruction of such information, is necessary.

In order to handle sensitive information appropriately it is necessary to ensure that staff have appropriate clearances and are educated on policies and procedures. These types of policies are not necessarily familiar to emergency managers and private industry. Since much of the sensitive and classified information comes from the security community, they should be engaged to understand the types and security levels of information likely to be exchanged, and could be a resource for policy guidance.

### **3.2 Expectations for Information Sharing**

The PREOC was a hub of information sharing, hosting many agencies and government departments and acting as a focal point for information exchange with security and games partners. Local authorities, agency representatives, and higher government officials seemed to have expectations that this broad range of situational awareness information would be made available to them. However, at the beginning of the Games it became apparent that there was a lack of agreement and understanding on what the PREOC would report on and to whom. For example, the number of requests for information at the senior/political levels was unexpected, often outside the normal areas of interest, and not practiced during the exercises leading up to the Games. On the other hand, some agency representatives were receiving the bulk of their information from other sources and were disappointed that it was not available from the PREOC.

PREOC management was concerned that providing the additional information available during the Olympics would create an unrealistic expectation for future operations. Since there were few emergency management incidents during the Olympics, PREOC staff were not overloaded and were able to meet the demands for information sharing from their seniors. However, during a normal activation, staff often carry heavy workloads, and providing additional information could overburden staff and prevent them from performing their primary functions.

#### *Recommendations:*

Agreements for information sharing, including the information to be shared, when and with whom, should be discussed, established, and communicated to all parties in advance

of a major event. The lack of clarity about PREOC information sharing could have led to a disruption in operations had circumstances been different. One unanticipated demand was the degree to which senior members of organizations wanted to be kept abreast of developments. These individuals for the most part did not participate in the preparatory exercises and so it was difficult to anticipate the level of interest in advance. A clear description of responsibilities and expectations in this regard would have mitigated the risk and burden on the PREOC.

### **3.3 Introduction of New Software**

The PREOC adopted a new software tool called ETeam in the lead up to the Games to facilitate situational awareness. It had been used in previous exercises but not to the degree that it was used during the Olympics, and staff had varying training and comfort levels with the tool. Since it was new, there were some policies and processes that had not been completely worked out and there was some confusion over its use (for example, some felt it was used more for documentation than for situational awareness). As a result, it was used to different degrees by different individuals.

*Recommendations:*

When new tools are introduced, they should be thoroughly examined to understand how to meet the needs of the target user community and the longer-term implications of its implementation. It is important to exercise use in advance of operations in the same way tools are intended to be used during operations, in order to identify and resolve any issues.

### **3.4 PREOC Situational Awareness (SA)**

On several occasions there were problems achieving shared situational awareness (SA) within the PREOC, with some staff occasionally unaware of information that had the potential to impact their role in the operation. For example, at one point during the activation, the telephone lines became inoperative and backup systems had to be used. While some staff members were aware of the details of the situation and how it would be resolved, information during the transition to the backup system was not shared with all operational staff. Several agency representatives also reported that information did not always flow well from the command room to the agency room.

*Recommendations:*

Shared situational awareness is critical in operations centres to ensure that staff are aware of operationally relevant information and can perform their roles effectively. Periodic verbal briefings given to all staff by a staff member who has current information is an effective method of ensuring shared SA. In the case of the PREOC, the authors recommended that key PREOC staff (such as the director and agency branch coordinator) give regular briefings on current incidents and information, as well as opportunistic briefings when key information about incidents became available. In the authors'

experience, even if there are alternative means of maintaining situational awareness, a verbal brief is often the best and most reliable method of ensuring everyone in the room is aware of the current situation.

### **3.5 Chain of Command**

The chain of command was occasionally subverted, which seemed to occur most often when dealing with security-related information (this, again, speaks to the importance of having a clear policy and guidelines). In the normal chain of command, the agency representatives dealt with an agency branch coordinator; however, at times the agency branch coordinator and operations chief were bypassed in the chain of command by the director. This led to confusion because the agency representatives were unsure of when to deal with the director over the agency branch coordinator. In addition, when the chain of command is bypassed, individuals become removed from the information sharing loop, potentially affecting the ability to fulfill their roles.

*Recommendations:*

Consistent use of the chain of command by all staff is critical. Inconsistency in the chain of command causes confusion among staff and management and can contribute to breakdowns in situational awareness and decision-making abilities. It is recommended that leaders emphasize the importance of the chain of command, review reporting processes to ensure they are sensible, and practice and enforce the chain of command.

### **3.6 Leadership**

The PREOC had several directors working during different shifts. The various personalities, experience, and styles of leadership led to inconsistencies and sometimes conflicting direction between directors. In general, management staff tended to lack consultation with one another between shifts. One operator noted that there was variability in how individual directors interpreted the concept of operations document. Because the PREOC had only a small number of incidents to deal with, these inconsistencies did not lead to major problems. However, had the operation escalated because of major incident, these small inconsistencies might have had a larger negative impact on operations.

*Recommendations:*

It is important for management staff to act as a united team, coordinating plans and actions across shifts and delivering a consistent message to staff in order to prevent confusion or conflict about procedures and goals. Regular management meetings should occur to discuss strategies, plans, actions and resolve issues.

### **3.7 Consistency of Standard Operating Procedures (SOPs)**

Inconsistencies in standard operating procedures (SOPs) were occasionally noted, especially where the procedures were unclear (for example, regarding the handling of sensitive information) and some staff reported that the interpretation of procedures varied between directors. Concern was also expressed over the modification of SOPs during the course of operations. For example, “change management” forms were created by one director/shift as a way to track and document suggested changes to SOPs and it was proposed that the director on duty be able to sign off on changes within their responsibility. However, directors did not necessarily have the authority to authorize permanent changes to standard operating procedures.

*Recommendations:*

Documented and clear SOPs are recommended to prevent confusion and provide consistency, and staff should be educated regarding any SOPs which are relevant to their position. Failure to do so can produce inconsistent application of procedures leading to inefficiency or errors. SOPs should be prepared well ahead of the operation to provide ample time for training. In the authors’ experience, not all staff read new SOPs, and therefore training becomes even more important.

When operational conditions change SOPs may become ineffective and therefore counterproductive. Hence there may be a requirement to adjust SOPs and change procedures to accommodate those adjustments. These procedures should be clear to staff as well as transparent so that all staff are familiar with and can adapt to any changes. While adjustments to operations may be required, it should be noted that applying a change during particular circumstances does not necessarily make it a “best practice” for the organization under all circumstances, so caution needs to be taken with broad-sweeping changes.

### **3.8 Exploitation of the C2 Analysis**

PREOC management had requested that issues be brought to their attention as they were identified during the Olympic activation. Hence, the authors shared many of the issues discussed here, along with observations beyond the purview of this paper, with PREOC and EMBC management during and shortly after the Olympics [10]. A report was also produced discussing the results of the analysis, including survey responses, in detail [9]. Many of the recommendations provided were acted upon by PREOC staff and addressed in time for the Paralympics, such as short-term suggestions for sensitive information sharing, though other issues could only be addressed over a longer term. The authors also recommended that modifications to operations for V2010 that would have long-term benefits should be further explored and instituted across EMBC where possible.

## **4.0 CONCLUSIONS**

### **4.1 Research Methodology**

During the PREOC deployment DRDC scientists used four methods for collecting data: 1) pre-deployment knowledge gathering; 2) direct observation; 3) semi-structured interviews, and 4) a survey. The pre-deployment knowledge gathering was accomplished by working with IPS and PREOC staff, prior PREOC C2 and process analysis, and studying available materials. Preparation was critical because without appropriate background knowledge analysts would not have been able to understand PREOC operations in context and focus on relevant issues.

Direct observations provided invaluable information, such as first-hand knowledge on how events unfolded, and allowed analysts to establish relationships with PREOC staff. Ultimately, the analysts' ability to perceive issues, analysts' depth of knowledge on operations, and the opportunity to observe operations at various levels affected the interpretation of the observations. Ideally, multiple observers would be deployed in key areas to scale to the size of the operation.

The semi-structured interviews performed near the end of the operation were also a very valuable source of data. They provided an opportunity for operators to explain issues from their point of view and for analysts to understand situations from multiple perspectives. Surveys allowed for anonymous feedback and documentation of issues and comments by staff. The numerical responses also provided a means of gauging staff's agreement or disagreement with various statements.

## **4.2 Final Recommendations**

The PREOC activated in a pre-planned manner for V2010 and had to work with new organizations such as VANOC and the ISU. The authors noted several challenges that occurred during the Olympic operation. The major issues identified included: a) with handling and sharing sensitive information; b) regarding expectations for information sharing with other organizations and the requests for information from senior officials; c) the use of relatively new software; d) situational awareness within the operations centre e) chain of command confusion, particularly in regards to how sensitive information was shared; f) leadership, with some conflicting direction between directors; g) inconsistencies in standard operating procedures. While the issues identified were specific to the PREOC during the Olympics, many of the recommendations may also apply to other operations centres that encounter similar problems.

Sharing of information was a major theme of the challenges. Some information (for example, situational awareness information, procedures, guidelines) needed to be shared with staff and other agencies while some had limited distribution (for example, sensitive information obtained from an agency). Plans and rules for the sharing of information are a key part of high level operations planning. Gaps in this area can lead to a potentially dangerous lack of situational awareness among operators or, conversely, inappropriate information leaks. The most challenging issue for the PREOC appeared to be the handling of sensitive information. This posed challenges when dealing, in particular, with the ISU as well as some critical infrastructure asset owners. To effectively handle and share sensitive information, clear definitions, policies, and clearances are required and

staff must be educated and trained appropriately. Adequate means of transmittal (secure networks, phones, fax, etc.) are also required. This issue was not unique to the PREOC; cross-organizational sensitive information sharing was identified as a major issue in the V2010 after-event reviews performed by various organizations.

Several of the issues identified in this paper stemmed from not having clear guidelines on operations that were known to operators. In order for an inter-agency operation to be successful, every player has to understand their role, responsibilities, and operating procedures. Hence it is critical that documents that describe these be prepared well ahead of time, exercised with necessary players, and, most importantly, that operators are well versed in how they apply to their position. That being said, it is not always possible to predict or control issues that will occur in an operation and there are times when processes and procedures can become ineffective; when this happens there must be clear and known mechanisms to modify the rules. If these do not exist, ad hoc changes may not be properly vetted and may not be understood and applied by staff.

Finally, the reader should be reminded that the use of operational analysts (especially those with an outside perspective) was a departure from the norm. The authors believe that operational analysis and the use of knowledge capture and exploitation is an effective means of improving operations. Data from actual emergency operations, especially gathered *in situ*, is still relatively rare. The PREOC reported that DRDC's feedback was useful, and based on that feedback and the recommendations provided after exercises and during the Olympics, changes were made to improve operations. Exploiting observations and recommendations was not only useful for the PREOC but could potentially be valuable for any operations centre, especially those preparing for novel or unique operations.

## **5.0 ACKNOWLEDGEMENTS**

The authors would like to thank EMBC staff for welcoming us, and Dr. Anthony Masys and Elaine Maceda for their contributions to the original C2 analysis.

## REFERENCES

1. *South West Provincial Regional Emergency Operations Centre (PREOC) Overview*, PowerPoint presentation prepared by Emergency Management British Columbia, 2009
2. *British Columbia Emergency Response Management System Overview (Interim)*, Provincial Emergency Program, September 2000, available from:  
[http://www.pep.bc.ca/bcerms/bcerms\\_overview-manual.pdf](http://www.pep.bc.ca/bcerms/bcerms_overview-manual.pdf)
3. Genik, L., Lauder, M., *Analysis of Provincial Regional Operations Centre (PREOC) Operations During Exercise Silver*, Defence Research and Development Canada Letter Report, February 2009
4. Genik, L., Lauder, M., Maceda, E., *Analysis of EMBC's South West Provincial Regional Operations Centre (PREOC) Operations during Exercise Gold*, Defence Research and Development Canada Letter Report, December 2009
5. Dixson, M., Genik, L., *Application of Command and Control Architecture Frameworks for Security and Emergency Management Planning*. In Modelling and Simulation of Complex Systems in Public Safety and Military Operations (pp. 16-1 – 16-12) Meeting Proceedings RTO-MP-MSG-082, Paper 16. Neuilly-sur-Seine, France: RTO. 2010, Available from: <http://www.rto.nato.int>
6. Smith, D., Maceda, G.E., *Strategies for ad-hoc Data Collection and Analysis During Major Event Interagency Exercises and Operations*. In Knowledge Systems for Coalition Operations 2010, Proceedings, Available from:  
<http://www.aiai.ed.ac.uk/project/coalition/ksco/ksco-2010/contents.html>
7. Andrews, M., Cullen, D., et al, *Provincial Regional Emergency Operations Centre Operational Guidelines In Support of the 2010 Winter Olympic & Paralympic Games*, prepared by Emergency Management British Columbia, 2010
8. *Provincial Regional Emergency Operations Centre Management*, Produced for Provincial Emergency Program Ministry of Public Safety and Solicitor General by The Emergency Management Division Justice Institute of BC, First edition 2008
9. Smith, D.G., Genik, L., Maceda, G.E., Masys, T., *Vancouver 2010 PREOC Operations Report*, Defence Research and Development Canada Letter Report, March 2010
10. Smith, D., Genik, L., Masys, A., *Vancouver 2010 PREOC Operations Quick Look Report*, PowerPoint presentation, March 2010

## **ANNEX A. Vancouver 2010 Integrated Connectivity Schematic Acronyms**

### **PUBLIC SAFETY**

BCAS - BC Ambulance Service  
BCCS - BC Coroner's Service  
BCSS - BC Sheriffs Service  
CCG - Central Coordination Group (Provincial)  
CF - Canadian Forces  
DOC - Department Operations Centre  
ECOMM - Southwest British Columbia Emergency Communications Centre (Urban Domain 911)  
EOC - Emergency Operations Centre  
GOC - Government Operations Centre (Federal Ops Centre in Ottawa)  
ICP - Incident Command Post (Agency Representation Dependent on Response Needs)  
INAC - Indian and Northern Affairs Canada  
IPS - Integrated Public Safety  
MDEC - Minister/Deputy Minister Emergency Council- Provincial  
MoH - Ministry of Health  
MoT - Ministry of Transportation  
OFC - Office of the Fire Commissioner  
Other - Other additional agency representatives dependent on emergency event  
PAB - Public Affairs Bureau  
PECC - Provincial Emergency Coordination Centre  
PEP - Provincial Emergency Program  
PREOC - Provincial Regional Emergency Operations Centre  
PS - Public Safety Canada  
RCMP - Royal Canadian Mounted Police  
RD - Regional District  
TEAMS - Temporary Emergency Assignment Management System

### **GAMES**

BCAS - BC Ambulance Service  
CEO - Chief Executive Officer  
CMT - Crisis Management Team  
IMT - Incident Management Team  
MOC - Main Operations Centre  
VANOC - Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games  
VGM - Venue General Manager  
VFM - Venue Function Manager

### **SECURITY**

ACC - Air Command Centre

ASOCC - Air Support Olympic Coordination Centre  
CF - Canadian Forces  
CMDR - Commander  
COO - Chief Operations Officer  
EMBC - Emergency Management BC  
GJOC - Games Joint Operations Centre  
ICC - Integrated Command Centre (Comprises the ISU's Theatre Command, Area Command and Venue Command for Security)  
ICC Support File Management Office - Includes the Fusion Center and the IIT (Incident Interface Team)  
ISU - Integrated Security Unit  
JIG - Joint Intelligence Group  
LCC - Land Command Centre  
MCC - Marine Command Centre  
NOC - National Operations Centre (RCMP)  
OCC - Operational Communications Centre  
OMOC - Olympic Marine Operations Centre  
PA - Public Affairs  
PS - Public Safety Canada  
RCMP - Royal Canadian Mounted Police  
TCC - Theatre Command Centre  
VACC - Vancouver Area Command Centre (West Vancouver, Vancouver, Richmond)  
Venue - Olympic Venue Site  
WACC - Whistler Area Command Centre

#### OTHER

GPPAG - Government Partners Public Affairs Group

## **ANNEX B. Interview questions**

### V2010 Feedback from PREOC Staff

1. What is your name and position?
2. What is your experience?
3. What is your training/participation in previous exercises? Have you noticed any changes in operations as a result of the exercises?
4. What, in your opinion, is working?
5. What, in your opinion, isn't working?
6. Do you understand the roles and responsibilities of your position and feel that you've been appropriately trained?
7. Do you have appropriate SA? Who do you communicate with as part of your position?
8. How well do you feel the PREOC functions?
9. Do you have any concerns about the preparations for the Paralympics? What improvements would you suggest?
10. Do you have comments about the use of ETeam? (For example, its role in ops.)  
Do you understand how/when/why to use it?
11. How has information classification affected your work? Do you handle sensitive information and understand how to deal with it?
12. How are shift handovers working? (Alpha/Bravo and Day/Night)
13. Do you have any additional comments?
14. Are you generally comfortable working in the PREOC?

## ANNEX C. PREOC V2010 Operations Participant Survey

### **PREOC V2010 Operations Participant Survey**

Name (optional): \_\_\_\_\_ Date Completed: \_\_\_\_\_

This questionnaire was designed to obtain your feedback with regards to PREOC V2010 operations. Your feedback is important! Where you have identified issues, specific suggestions for improvement would be appreciated.

**1 Please identify your section within the PREOC**

Mgmt       Section Head       Ops       Pln       Log  
 Finance/Admin       Agency Rep       Other

**2 What was your position? Please complete a separate survey for each position held.**

**3 Please rate your agreement with the following statements as they relate to your experience during V2010 operations and provide comments/suggestions for improvement as required.**

Statement	Agreement Rating						Comments/Suggestions for Improvement	
	Strongly Disagree		Strongly Agree					
	1	2	3	4	5	N/A		
a) The training I received was adequate	1	2	3	4	5	N/A		
b) My role and responsibilities were clear	1	2	3	4	5	N/A		
c) My role was suitable for my skill set	1	2	3	4	5	N/A		
d) I had sufficient situational awareness to perform my duties	1	2	3	4	5	N/A		
e) I had sufficient tools and resources to perform my duties	1	2	3	4	5	N/A		

Statement	Agreement Rating						Comments/Suggestions for Improvement	
	Strongly Disagree		Strongly Agree					
	1	2	3	4	5	N/A		
f) I understood how to handle information I received	1	2	3	4	5	N/A		
g) ETeam provided enhanced situational awareness	1	2	3	4	5	N/A		
h) The role of ETeam in operations was clear	1	2	3	4	5	N/A		
i) I was able to use ETeam effectively	1	2	3	4	5	N/A		
j) My workload was manageable	1	2	3	4	5	N/A		
k) I had adequate resources to deal with my stress level	1	2	3	4	5	N/A		
l) My overall PREOC experience during V2010 operations was positive	1	2	3	4	5	N/A		

**4 Based on your experience during V2010 operations, please rate the effectiveness of the following elements and provide comments/suggestions for improvement as required.**

Statement	Effectiveness						Comments/Suggestions for Improvement	
	Ineffective		Very Effective					
	1	2	3	4	5	N/A		
a. PREOC V2010 Conops document	1	2	3	4	5	N/A		
b. PREOC chain of command	1	2	3	4	5	N/A		
c. PREOC information handling processes	1	2	3	4	5	N/A		
d. PREOC decision-making processes	1	2	3	4	5	N/A		
e. Use of display information (projection boards, white boards, TVs, wall space, etc.)	1	2	3	4	5	N/A		
f. Information sharing processes with new entities in place for V2010 (e.g. VANOC, TCC, Provincial Games, Secretariat, GPPAG, PS Presence)	1	2	3	4	5	N/A		
g. Coordination with new entities in place for V2010 (e.g. VANOC, TCC, Provincial Games, Secretariat, GPPAG, PS Presence)	1	2	3	4	5	N/A		

- 5      Please provide your feedback/comments on the changes implemented as a result of the V2010 exercise program (Exercises Bronze, Silver, Gold)**
- 6      What worked during V2010 operations?**
- 7      What didn't work during V2010 operations?**
- 8      Recommendations for improvement**
- 9      Any comments on duration of deployment or the shift hours that you were assigned?**
- 10     Please provide any additional comments**

You have completed the questionnaire. Thank you. Please return it to one of the DRDC staff members at the PREOC (David Smith, Lynne Genik, or Tony Masys).



Defence Research and  
Development Canada

Centre for Security Science  
222 Nepean Street, 11<sup>th</sup> floor  
Ottawa, Ontario  
K1A 0K2

Recherche et développement  
pour la défense Canada

Centre des sciences pour la sécurité  
222, rue Nepean, 11ième étage  
Ottawa, Ontario  
K1A 0K2

May 27, 2011

16th International Command and Control Research and Technology Symposium,

Lynne Genik and David Smith authors of the conference paper Command and Control Analysis of the South West Provincial Regional Emergency Operations Centre during Vancouver 2010 carried out this research on behalf of Defence Research and Development Canada (DRDC), and as such the copyright in the paper vests with the Government of Canada (Crown). No provision exists for the transfer of any such Crown copyright, and no action within this document represents such a transfer to your organization.

However, I am authorized to provide your organization with a non-exclusive permission to use the copyright article in any way you wish, as long as its source is acknowledged, by indicating on the document "Copyright (c) Her Majesty the Queen in Right of Canada as Represented by the Minister of National Defence (2011). This copyrighted work has been created for Defence Research and Development Canada, an agency within the Canadian Department of National Defence."\*

You may also give others permission to translate and to reproduce this document in any form, providing that its source is clearly indicated as previously mentioned\*.

Dr. Mark Williamson  
DRDC Centre for Security Science

Chair  
Document Review Panel

Canada

DEFENCE  DÉFENSE

# Command and Control Analysis of the South West Provincial Regional Emergency Operations Centre during Vancouver 2010

Lynne Genik  
DRDC Centre for Security Science

David Smith  
DRDC Toronto

June 2011



# Overview

- Introduction and background
- Methodology
- Major observations
- Conclusions

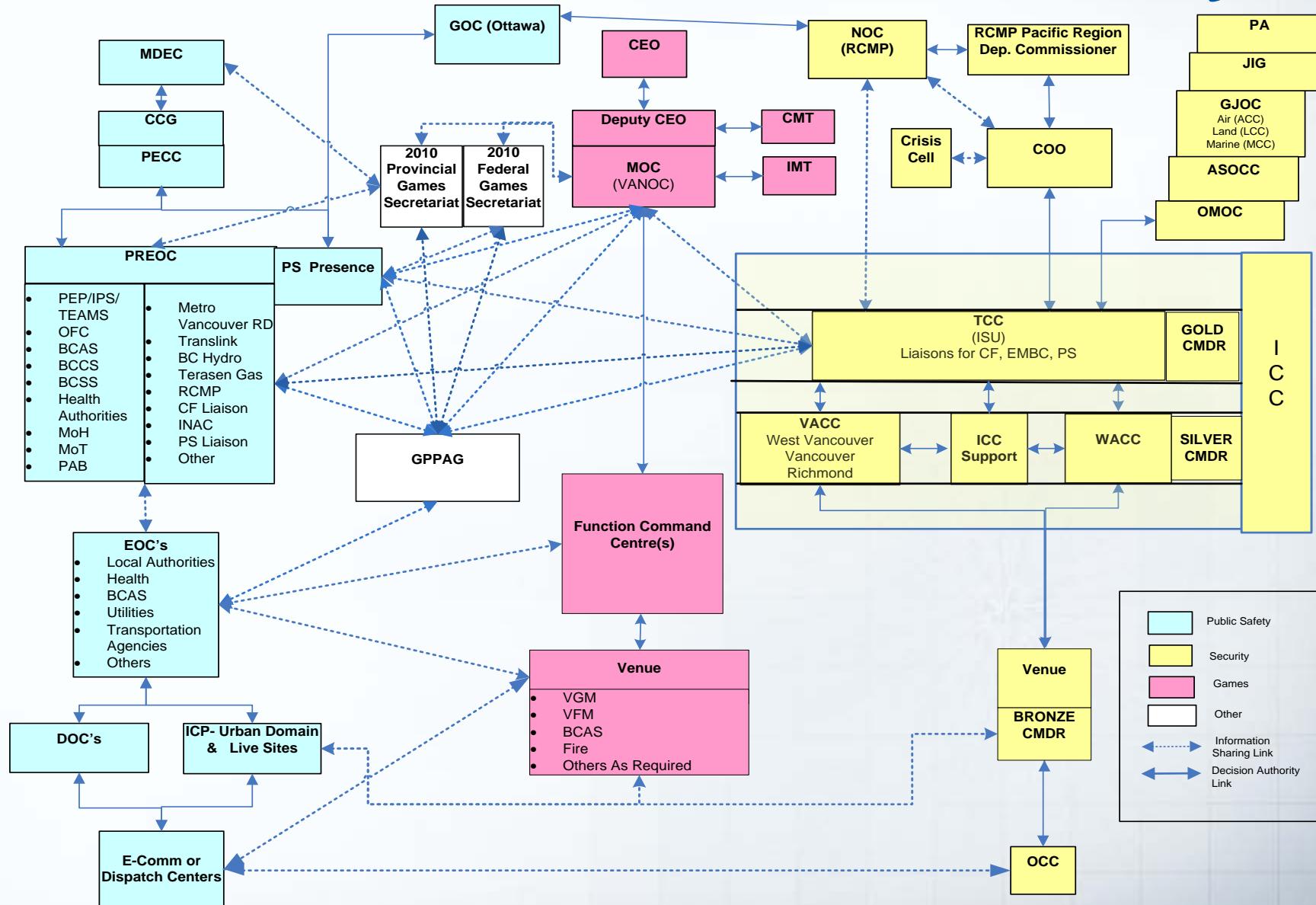


# Vancouver 2010 Olympic Winter Games

- February 12-28, 2010
- 82 participating countries, 6500 athletes and officials, 1.6 M tickets
- Planning started years in advance



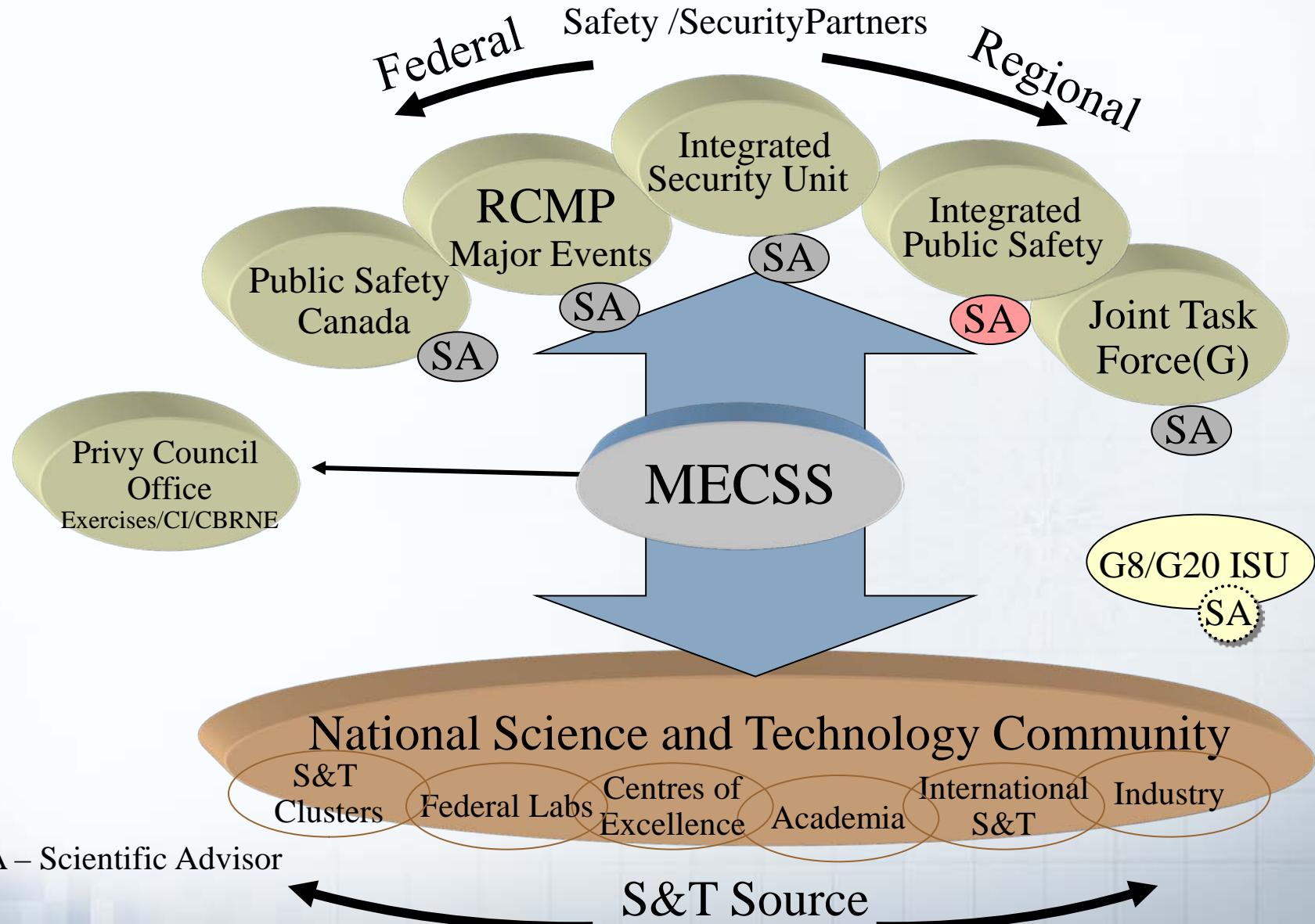
## Vancouver 2010 Integrated Connectivity Schematic



# DRDC Major Events Coordinated Security Solutions (MECSS) Model



*“Operationalizing S&T Investment”*



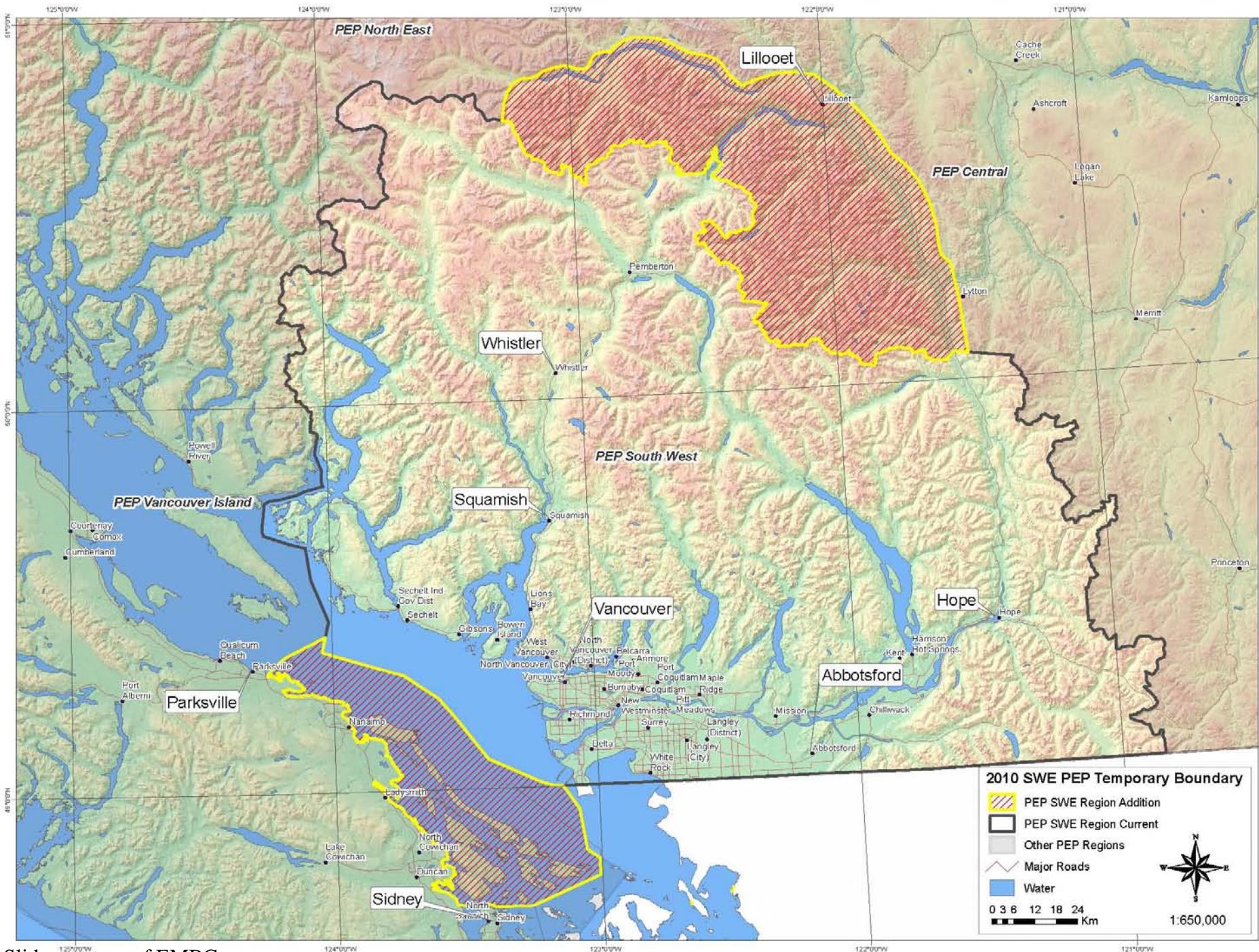
SA – Scientific Advisor

# Integrated Public Safety and the South West PREOC

- IPS video:

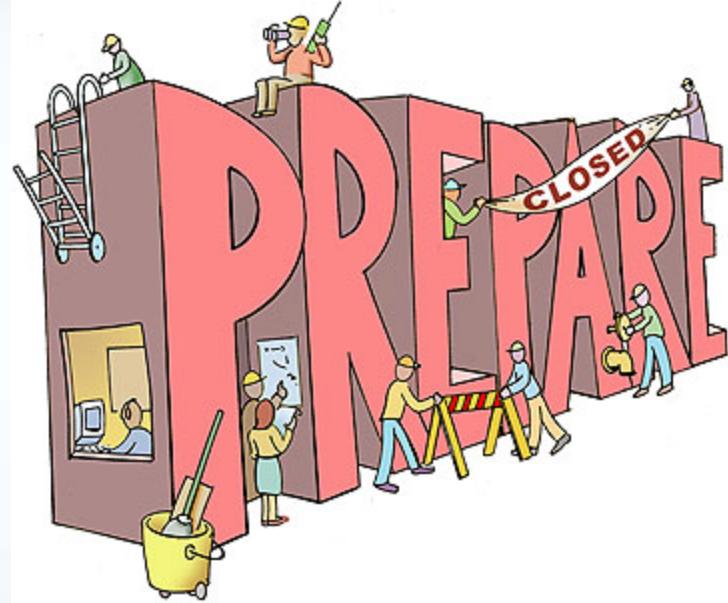
<http://www.youtube.com/watch?v=IZbnwpCFgiI&feature=youtu.be>





# Preparing for the Games

- Three “pillars” of V2010:
  1. Public Safety
  2. Security (new)
  3. Games (new)
- Three major preparatory exercises (Bronze, Silver, Gold)
  - DRDC teams analysed PREOC operations for Silver & Gold
- DRDC scientific advisors applied architecture frameworks with EMBC staff for PREOC operations to help:
  - Articulate requirements
  - Understand interactions with other organizations
  - Define processes
  - Focus and manage planning



# C2 Analysis Methodology

- DRDC resources
- Preparatory research and experience
- Focus of C2 analysis
- Direct observation
- Semi-structured interviews
- Surveys
- Limitations



# Major Observations

- Objective of analysis: To observe and report on issues to improve PREOC operations
- Despite significant preparation, including joint exercises with VANOC and the ISU, PREOC encountered some operational problems



# Handling of Sensitive Information

- Issue:
  - Lack of comprehensive policy
    - Confusion over identifying sensitive information/rules for sharing
      - E.g., information provided by critical infrastructure asset owner shared outside of the PREOC to dismay of owner
    - Staff often erred on over-cautious side, unnecessarily limiting information sharing



Recommendation: Sensitive information should be clearly identified, shared with all PREOC staff, and only shared beyond the PREOC with the explicit consent of the director

# Information Sharing

- Issues:
  - Lack of agreement and understanding on what PREOC would report on and to whom
  - Concern that providing additional information would create unrealistic expectations for future
- Recommendation: Agreements for information sharing should be made in advance, documented and communicated to all parties



# New Software

- Issues:
  - PREOC adopted new software tool (Eteam) in lead-up to the Games to facilitate situational awareness
  - Some policies and processes not completely worked out - led to confusion
  - Staff had various levels of training and comfort with tool
- Recommendation: Protocols for tool use should be established and full use of tools exercised before major event



# Situational Awareness (SA)

- Issues:
  - Staff not always aware of issues that could affect operations
    - E.g., telephone line repair
  - PREOC organized in two rooms: Command Room for PREOC staff and Agency Room for agency representatives
    - Information flow often perceived as “one way” from the Agency Room to the Command Room
  - Recommendation: Regular all-staff briefings should be provided by director or another individual with a holistic understanding of issues



## SITUATIONAL AWARENESS

Some have it, and some don't

JOANNA'S CHEEZBURGER.COM ☺ ☺ ☺

# Chain of Command

- Issues:
  - In normal chain of command, agency representatives dealt with agency branch coordinator
    - At times, director bypassed agency branch coordinator and operations chief (usually for security-related issues)
    - Led to confusion - agency representatives unsure of when to deal with director over agency branch coordinator
- Recommendation: Chain of command should be enforced to maintain situational awareness for staff and reduce confusion as to the roles of senior staff



# Shared Leadership

- Issue:
  - Several individuals in director role during different shifts
    - Personalities, experience, leadership styles led to inconsistencies and sometimes conflicting direction
- Recommendation: Management staff should operate as united team, coordinating plans and actions across shifts and delivering consistent message to staff



# Consistency of Standard Operating Procedures (SOPs)



- Issues:
  - Inconsistencies in SOPs occasionally noted
    - Especially when procedures unclear
  - Interpretation of procedures occasionally varied between directors
    - E.g., “change management” forms created by one director/shift
- Recommendations: Documented and clear SOPs should be established to prevent confusion and provide consistency, staff should be educated regarding relevant SOPs

# Conclusions

- Research methodology
  - Pre-deployment knowledge gathering
  - Direct observation
  - Semi-structured interviews
  - Survey
- Each provided valuable and complementary information



# Final Recommendations

- Info sharing a theme of challenges
- Clear definitions, policies, clearances, etc. required
  - Staff must be educated and trained appropriately
- Operators must understand roles, responsibilities, operating procedures
  - Documented guidelines, training, thorough exercises
- Operational analysis and the use of knowledge capture and exploitation is an effective means of improving operations



